



CPUC Draft Proposal for CSI RD&D: Business Development and Deployment

CSI RD&D Workshop
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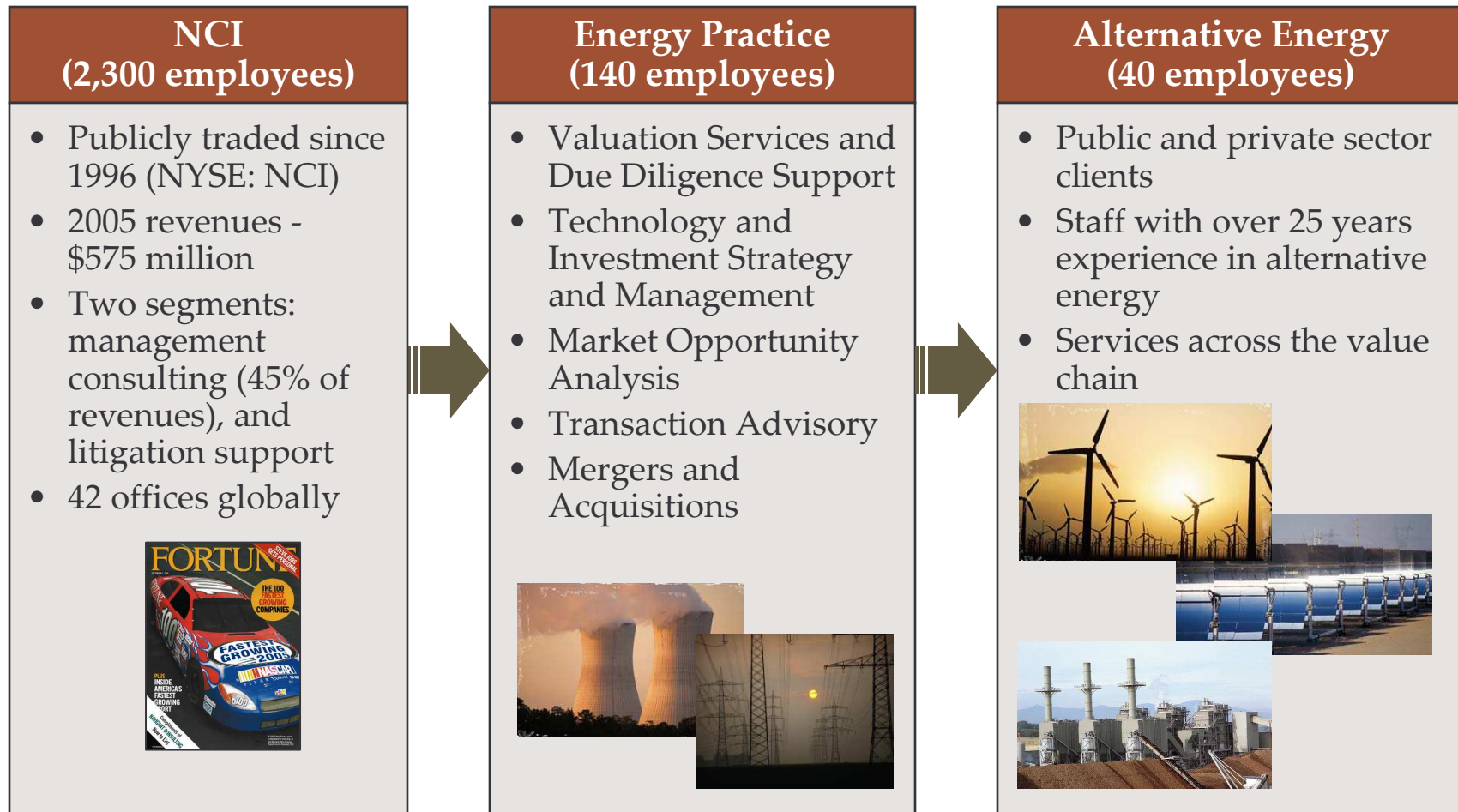
Purpose of Today's Presentation

The purpose of this presentation is to provide input to the CPUC RD&D planning process using results from the PIER PV Research Plan.

This presentation will:

- Provide background on the PIER PV Research Plan
- Compare the PIER PV Research Plan results with draft priorities set by the CPUC in the area of Business Development and Deployment
- Present findings from interviews conducted for the PIER PV Research Plan to address some of the CPUC's questions for the Business Development & Deployment activity area regarding:
 - Proposed funding share
 - Consideration of RD&D phases
 - Role of a California State Agency in PV RD&D

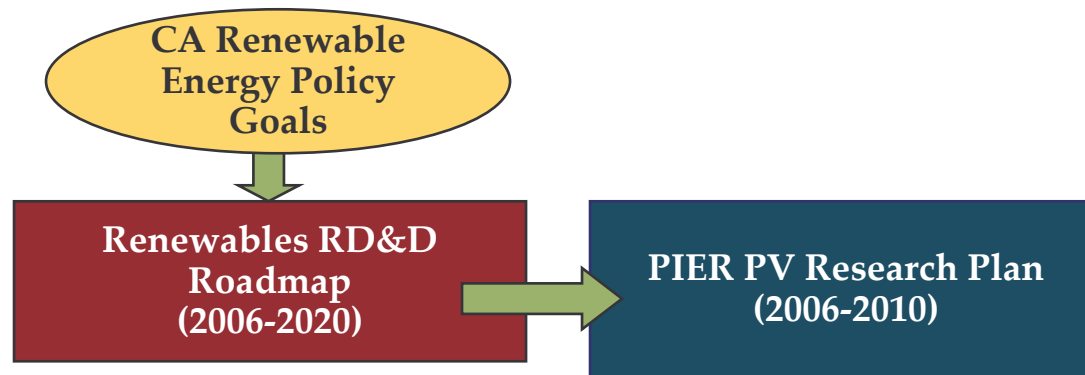
Navigant Consulting, Inc. (NCI) is a management consulting firm known globally for its alternative energy technology and strategy expertise.



NCI's alternative energy service offering falls into six basic categories.

Policy Development	Resource, Technology & Market Assessment	Strategy Development & Business Planning	Resource and Asset Acquisition & Development	R&D Management	Market Research & Education
<ul style="list-style-type: none">• Policy impacts• RPS portfolio development• Program resource allocations	<ul style="list-style-type: none">• Resource, technology and market assessments• Incorporation of renewables in Integrated Resource Planning• Forward price curves for RECs and locational pricing	<ul style="list-style-type: none">• Strategic planning and executive visioning• Competitive positioning• Business models• Diversified portfolio development• Risk management• Implementation strategies	<ul style="list-style-type: none">• Project feasibility• Project financing due diligence• M&A• Power purchase and sales agreements• Transmission rights and interconnection• Asset/investment optimization• RFP development• Evaluation of renewable bids	<ul style="list-style-type: none">• Research assessments• R&D roadmaps• Technology commercialization planning• Knowledge & technology transfer management	<ul style="list-style-type: none">• Solar service offering and subscription service• Public meeting facilitation

Using the PIER Renewables RD&D Roadmap as a basis, NCI worked with PIER Renewables to develop a multi-year PV Research Plan.



- Developed in 2006 over a 3 month period (September – November)
- Used milestones from the Renewables RD&D Roadmap as the basis
- Collaborated closely with CEC Renewable Energy Program, CPUC and IOUs, as all have RD&D needs related to implementing CSI and SB1
- Engaged key stakeholders to modify and then prioritize RD&D milestones to be supported by PIER Renewables

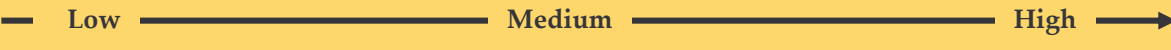
PIER PV Research Plan Background » Who provided input?

17 interviews were conducted with selected stakeholder organizations to modify and prioritize PV RD&D milestones.


List of Interviews					
No.	Organization	Contacts	No.	Organization	Contacts
1	Commission Renewables	Bill Blackburn, Emerging Renewables Program; Sandy Miller, Solar Program	10	Vote Solar	JP Ross, Policy Director
2	CPUC Staff	Jeanne Clinton, Clean Energy Advisor; Jaclyn Marks, Regulatory Analyst	11	Clean Energy States Alliance	Mark Sinclair, Clean Energy Group; Lew Milford, Executive Director
3	CPUC Leadership	Commissioner Peevey	12	Consol	Rob Hammon, Principal
4	PG&E	Hal LaFlash, Director Renewable Energy Policy & Planning; Bruce Bowen, Director of Regulatory Policy	13	CALSEIA	Les Nelson, Executive Director; Barry Cinnamon, President; Gary Gerber, Chair of Policy Committee
5	SCE	Stuart Hemphill, Director of Renewable and Alternative Power; Wil Grady, Technical Advisor Renewable and Alternative Power	14	SunPower	Dick Swanson, President & CTO
6	SDG&E	David Berokoff, Manager Technology Development; James D. Corlett, Sr. Technology Development Advisor	15	PowerLight	Brian Stone, VP Marketing; Jack Peurach, VP Product Development; Howard Wenger, Executive VP
7	SMUD	Jon Bertolino, Superintendent Renewable Generation Assets	16	NanoSolar	Brian Sager, VP Finance and Corporate Development
8	US DOE	Craig Cornelius, Technology Manager, Office of Solar Energy Technologies; Tom Kimbis, Technology Manager, Solar Technology Acceptance; Steve Chaulk, Acting Solar Program Manager	17	University of California, Merced	Roland Winston, Professor, School of Engineering and School of Natural Sciences
9	NREL	Robert Margolis, Senior Energy Analyst			

PIER PV Research Plan Background » How were milestones prioritized?

Stakeholders were asked to score each milestone based on its Potential Impact in meeting CSI and Need for PIER funding.

Potential Impact				
1	2	3	4	5
Milestone will have no impact on helping CA meet CSI and SB1.	Milestone will have small impact on helping CA meet CSI and SB1.	Milestone will have medium impact on helping CA meet CSI and SB1.	Milestone will have large impact on helping CA meet CSI and SB1.	Milestone will be instrumental in helping CA meet CSI and SB1.
				

Questions to Keep in Mind While Scoring
<ul style="list-style-type: none"> • If this RD&D milestone is achieved, how transferable will the results be to industry? • How likely is it that this RD&D milestone will be achieved? • Is this RD&D milestone important or even critical in terms of other milestones that follow it?

Need for PIER Funding Score				
1	2	3	4	5
No need for PIER to fund; tremendous RD&D in this area already.	Small need for PIER to fund; there are substantial RD&D efforts in this area already.	Limited need for PIER to fund; some RD&D in this area with need for limited additional effort.	Large need for PIER to fund; only small RD&D efforts in this area already.	Tremendous need for PIER to fund; no RD&D in this area already.
				

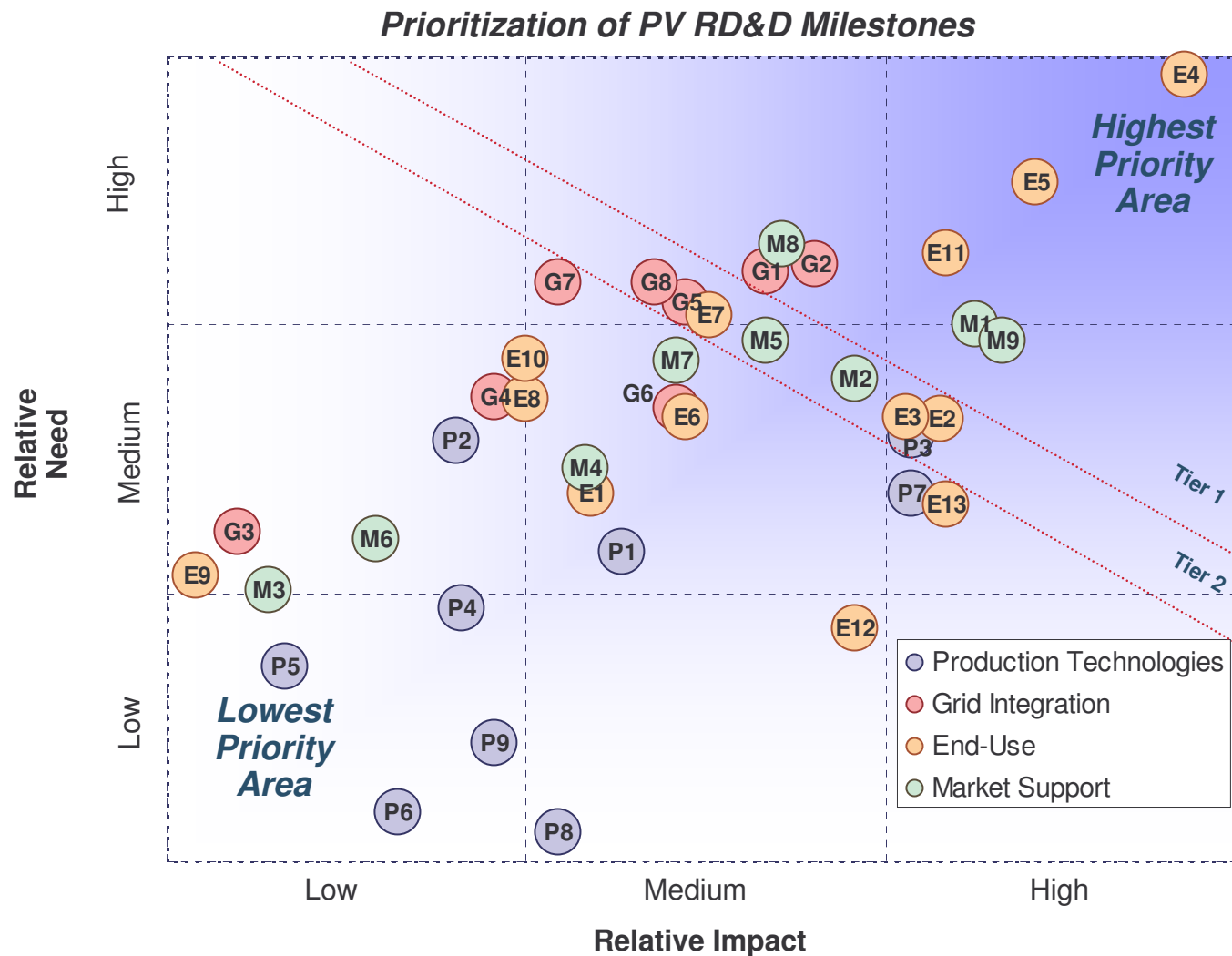
Questions to Keep in Mind While Scoring
<ul style="list-style-type: none"> • Is there already RD&D on this topic elsewhere? Will the milestone be met through those efforts? • How likely is it that this RD&D milestone will be achieved? • Is PIER the appropriate agency to fund this research?

The PIER PV Research Plan milestones fall into 4 platforms: Production Technology, Grid Integration, End Use and Market Support.

CPUC Activity Areas	PIER RD&D Platforms	Description	
Production Technology	Production Technology	Support commercialization of PV technologies	P
Grid Integration	Grid Integration	Enable PV integration with the distribution and transmission system	G
Business Development & Deployment	End Use	Support end-user adoption of PV by addressing end-user-specific technology and market issues	E
	Market Support	Support appropriate market mechanisms and policies that enable sustainable renewable energy growth	M

CPUC Staff combined the End Use and Market Support milestones to create the Business Development & Deployment activity area.

Analysis revealed the highest priority milestones based on the relative need for PIER funding and potential impact in meeting CSI goals.

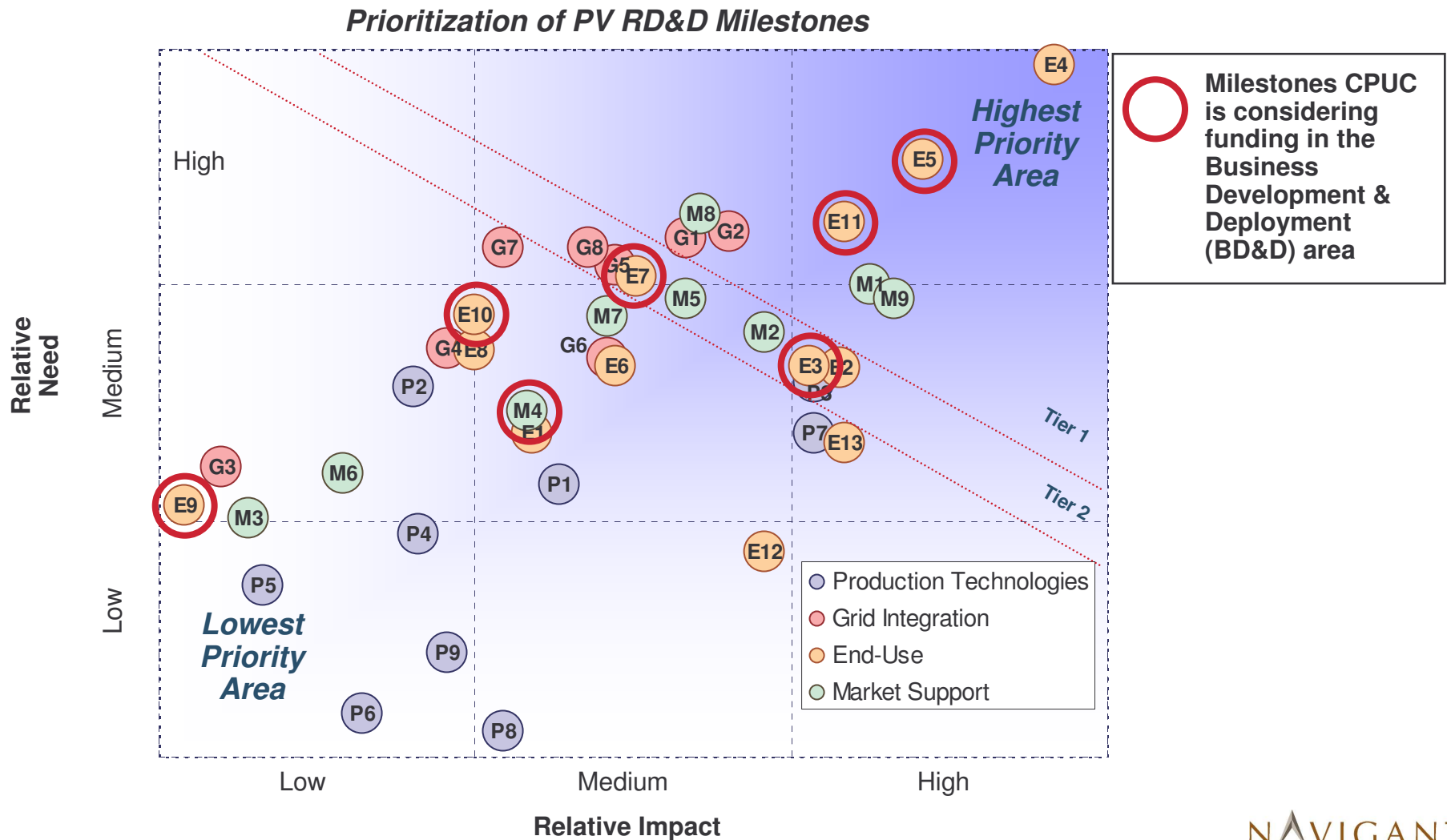


PIER PV Research Plan Background » What were the key results of the PV Research Plan? (continued)

Platform	Number	Year	Milestone Description
Production Technology	P1	'07	Potential changes to PV system design and installation requirements caused by the emergence of alternatives to silicon-based PV over next 15 yrs understood
	P2	'07	Key barriers to the development of PV mini-grids or central PV are identified
	P3	'08	PV system design and installation procedures enhanced to more effectively optimize system performance
	P4	'09	Higher capacity factors demonstrated (e.g. 20% vs. 18% for pitched roof, and similar improvements for flat roof mount) to meet CPUC PBI targets for CSI
	P5	'09	Economic viability of distributed concentrating PV systems demonstrated
	P6	'10	Highest silicon cell efficiency in market 22% (field efficiency)
	P7	'11	Building integral PV products become cost competitive with rooftop PV and key technical integration issues are addressed (e.g. spacing/cooling)
	P8	'15	Highest silicon cell efficiency in market 25.5% (field efficiency)
	P9	'15	Nano and/or organic PV economically feasible for grid-connected applications
Grid Integration	G1	'08	Cost/benefits of net metering (e.g. rate impacts) understood for SB1, as well as impact of raising net metering capacity to accommodate CSI goals
	G2	'08	PV systems with storage or other technologies demonstrate better coincidence with utility system peak load
	G3	'08	Possible net metering arrangements defined to facilitate cooperation between homes with solar access and neighbors who have shading and/or limited access
	G4	'08	Synergies between PV systems and plug-in hybrids are estimated
	G5	'08	High value locations for DG PV on T&D are identified and the impacts/benefits of large concentrations of DG PV in one location on T&D are assessed
	G6	'09	Technical and policy analysis complete to support successful expansion of Rule 21 to cover network interconnection
	G7	'09	Utility acceptance of protocols to allow PV system operation during grid outages
	G8	'10	Economic viability of new PV system storage technologies are demonstrated
End-Use	E1	'07	Operational risks and disputed benefits of PV systems identified (later priority issues to be studied)
	E2	'08	Drivers that encourage consumer adoption of PV systems are identified and prioritized
	E3	'08	New/modified business models create sustained market growth
	E4	'08	Synergies between building energy efficiency and PV are identified and business models to encourage synergies in retrofits and new construction are identified
	E5	'08	Potential roles for utilities in solar PV, including attractive business models, are identified and vetted with utility companies.
	E6	'08	PV system risk to homes and businesses quantified and results made available to financial / insurance industries
	E7	'08	Lower cost, utility grade PV system control, metering, and monitoring capacity developed consistent with 1% cost parameter established by CPUC for CSI
	E8	'09	Use of transformerless inverter design is widespread
	E9	'09	Business models developed to address fact that homeowners and renters move frequently
	E10	'10	Field tests done to quantify operational risks and benefits of PV (work heavily with utilities)
	E11	'10	Improved PV economics demonstrated using advanced metering, price responsive tariffs (e.g. TOU, Feed-in Tariff) and storage
	E12	'12	PV inverter cost reduced 30% (due in part to volume production) and performance improved
	E13	'17	Building integral PV products (e.g. PV replacing roofing material or side/curtain walls) are commonly used in new buildings (residential, commercial, industrial)
Market Support	M1	'07	Updated training for CA installers and building code officials developed and vetted with industry/policy makers
	M2	'07	Solar training and educational materials developed for architects, building land-use planning, and roofing personnel
	M3	'07	Barriers identified to the adoption of PV for use on public sector buildings (e.g. state/local government buildings, State water project)
	M4	'08	Key relevant RD&D results and strategies from Germany and Japan are identified and recommendations made for application in CA
	M5	'08	Module certification in CA is closely aligned with national and international standards, resulting in more robust and accurate ratings
	M6	'09	Differences in policies/regulations between Western states are identified and recommendations made to address differences that impede market growth in CA
	M7	'09	Key barriers to moving CA to Performance Based Incentives (PBI - kWh) from capital rebates (kW) are addressed
	M8	'11	Building standards established that require sufficient PV-ready roof space in new construction
	M9	'10	Options for including PV as part of CA residential building efficiency standards are developed and vetted with industry and policy makers

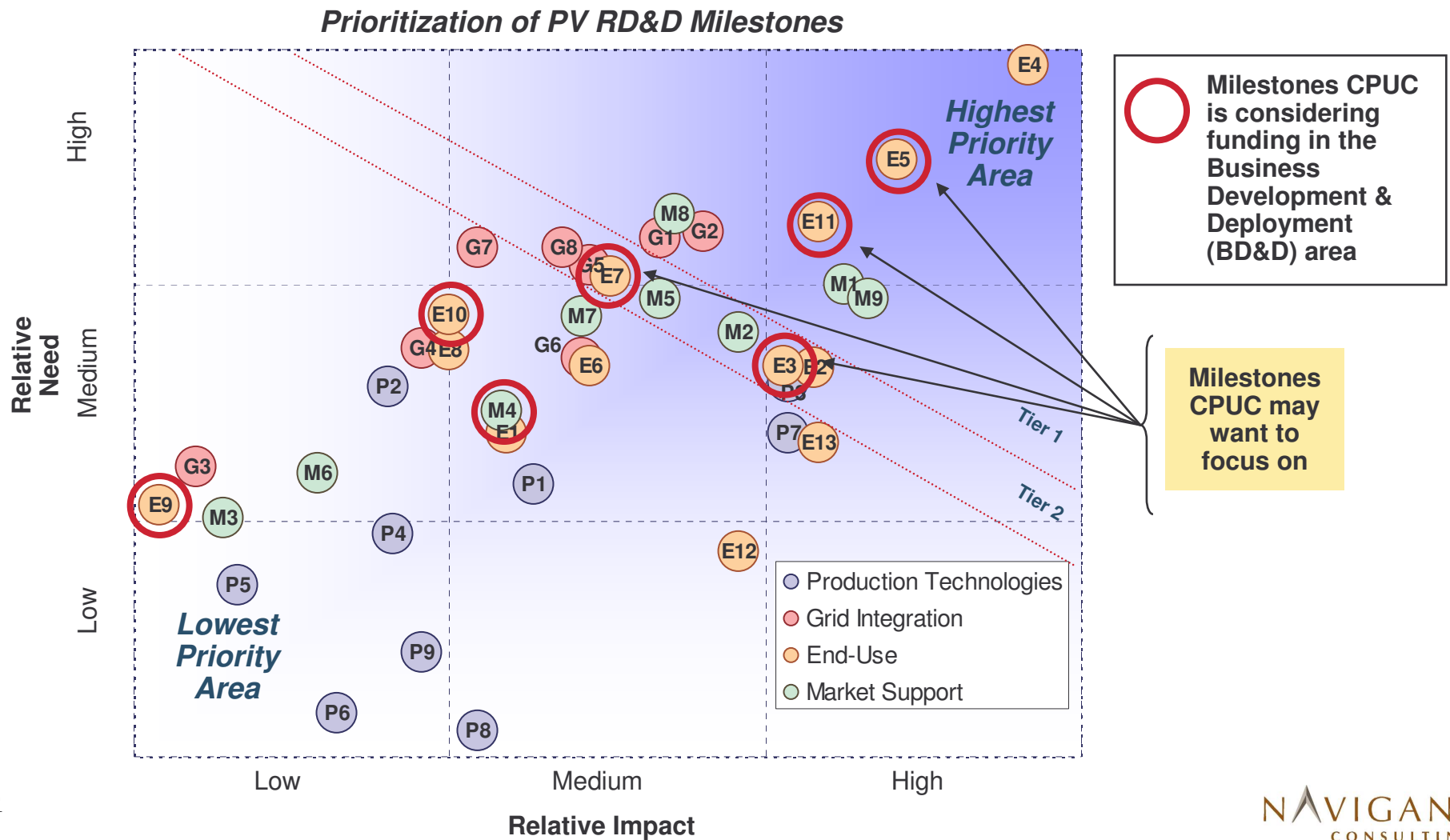
CPUC Target Activities » How the results overlap with CPUC's draft priorities?

In the Draft RD&D Plan CPUC suggests targeting seven milestones under the Business Development & Deployment (BD&D) activity area.



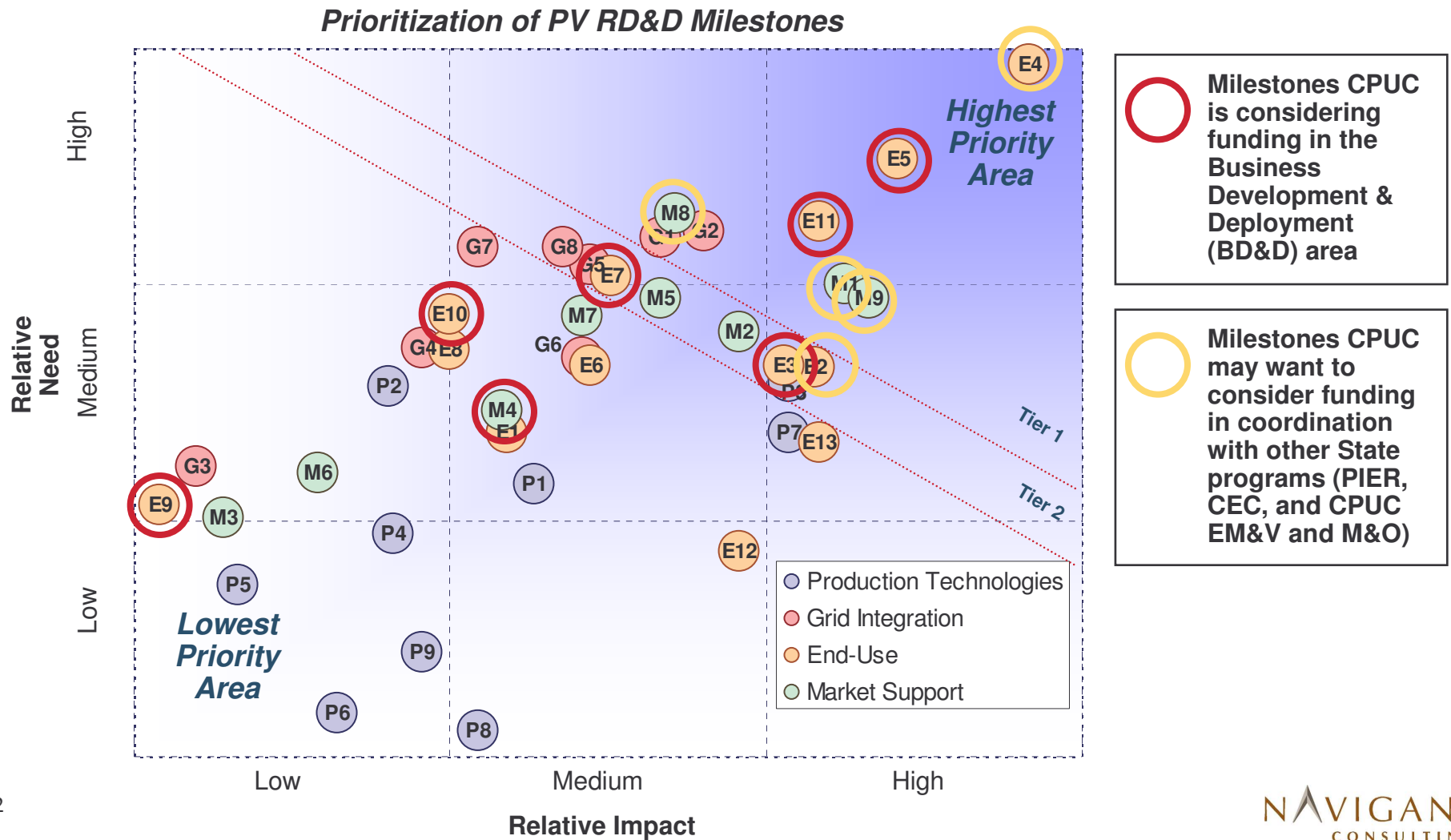
CPUC Target Activities » Are the target areas correct?

CPUC may want to focus its funding on the high priority Business Development & Deployment milestones it is targeting.



CPUC Target Activities » Are the target areas correct? (continued)

In addition, CPUC may want to consider coordination with other State programs to fund the other high priority BD&D milestones.



CPUC Target Activities » Does the proposed funding share seem reasonable?

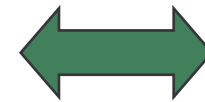
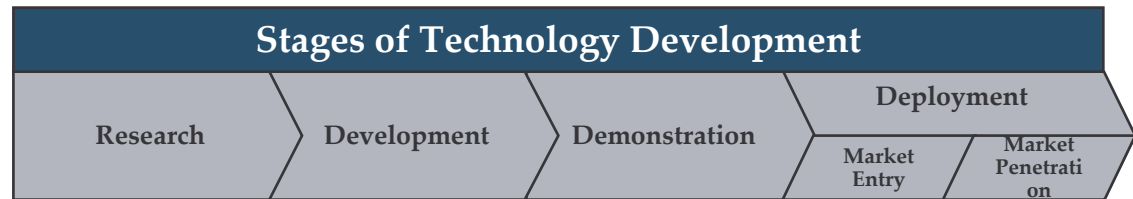
CPUC may want to consider increasing funding allocation to Business Development and Deployment based on PIER's findings.

CPUC Target Activity Allocation Compared to PIER's findings			
Target Activity Area	CPUC Allocation	Milestones in PIER Tier 1&2	Comment
RD&D Admin.	15-20%	NA	NA
Production Technologies	40%	1	Most milestones in the <i>Production Technologies</i> platform have a low need score. Many stakeholders interviewed believe PIER should not play a role in production technologies as industry and DOE are focused on this area.
Grid Integration	25%	4	Most milestones in the <i>Grid Integration</i> platform have a high need score, as stakeholders believe that PIER plays an important role in this area. However, these milestones received lower impact scores.
Business Development & Deployment	15-20%	11	In general, stakeholders thought that given limited State funding (compared to DOE and industry), PIER should focus on critical <i>End Use</i> and <i>Market Support</i> issues that neither industry nor the DOE are funding, especially in cases where issues are specific to CA as a market leader.

CPUC Target Activities » Should CPUC consider RD&D phase?

CPUC may want to consider targeting later stage demonstration projects, and not earlier stage research.

CPUC Allocation by Level of RD&D	
RD&D Phase	Allocation
Research	15-20%
Development	40%
Demonstration	25%
Deployment	15-20%



Stakeholder input to PIER PV Research Plan:

- Focus on later stage demonstration projects, not on early research.
- Play a role in helping to get products over the last commercialization hurdles and into the market.

Most stakeholders interviewed recommended funding later stage projects; technology demonstrations and helping to bring PV to market.

CPUC may want to consider other issues raised by stakeholders during PIER's interview process as it develops its RD&D priorities and plan.

Coordination

- Focus on issues that are unique to CA and that are not being pursued by industry or government agencies (e.g. DOE).
- Coordinate and complement RD&D from other State solar funds (e.g., CEC, PIER, marketing and outreach, and program evaluation).

Industry Support

- Take advantage of the “natural experiment” in CA, especially with respect to grid integration.
- Select research projects based on their impact on reducing the total installed cost per kWh.
- Benchmark installation practices and costs from US, Japan, and Germany (consistent with P3 milestone).
- Help PV module manufacturers attract capital to scale up production facilities as well as installation capacity. Capability to scale up should be considered an important factor.

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